

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE
in its capacity as elected Office

Date of mailing (day/month/year) 01 November 2000 (01.11.00)	
International application No. PCT/SE00/00547	Applicant's or agent's file reference 9937 PCT
International filing date (day/month/year) 22 March 2000 (22.03.00)	Priority date (day/month/year) 01 April 1999 (01.04.99)
Applicant NILSSON, Bengt	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
06 October 2000 (06.10.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Manu Berrod Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

KYLIN, Peter
Hynell Patenttjänst AB
Patron Carls väg 2
S-683 40 Hagfors/Uddeholm
SUÈDE

Date of mailing (day/month/year) 13 November 2001 (13.11.01)	
Applicant's or agent's file reference P9937-100	IMPORTANT NOTIFICATION
International application No. PCT/SE00/00547	International filing date (day/month/year) 22 March 2000 (22.03.00)

1. The following indications appeared on record concerning: <input type="checkbox"/> the applicant <input type="checkbox"/> the inventor <input checked="" type="checkbox"/> the agent <input type="checkbox"/> the common representative		
Name and Address KVAERNER CHEMREC AB Furhem, Hans P.O. Box 1033 S-651 15 Karlstad Sweden	State of Nationality	State of Residence
	Telephone No. 46 54 194627	<div style="transform: rotate(-15deg); font-weight: bold; font-size: 1.2em;"> RECEIVED DEC 21 2007 TC 1700 </div>
	Facsimile No. 46 54 142253	
	Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning: <input checked="" type="checkbox"/> the person <input checked="" type="checkbox"/> the name <input checked="" type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence		
Name and Address KYLIN, Peter Hynell Patenttjänst AB Patron Carls väg 2 S-683 40 Hagfors/Uddeholm Sweden	State of Nationality	State of Residence
	Telephone No. 46 563-235 20	
	Facsimile No. 46 563-236 96	
	Teleprinter No.	
3. Further observations, if necessary: Please note that the agent's file reference has also been changed.		
4. A copy of this notification has been sent to: <div style="display: flex; justify-content: space-between;"> <div> <input checked="" type="checkbox"/> the receiving Office <input type="checkbox"/> the International Searching Authority <input type="checkbox"/> the International Preliminary Examining Authority </div> <div> <input type="checkbox"/> the designated Offices concerned <input checked="" type="checkbox"/> the elected Offices concerned <input type="checkbox"/> other: </div> </div>		

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer François BAECHLER
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

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International application No. PCT/SE00/00547	International filing date (day/month/year) 22 March 2000 (22.03.00)

1. The following indications appeared on record concerning:

☒ the applicant
 ☐ the inventor
 ☐ the agent
 ☐ the common representative

Name and Address KVAERNER CHEMREC AB P.O. Box 1033 S-651 15 Karlstad Sweden	State of Nationality SE	State of Residence SE
Telephone No.		
Facsimile No.		
Teleprinter No.		

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person
 ☒ the name
 ☒ the address
 ☐ the nationality
 ☐ the residence

Name and Address CHEMREC AKTIEBOLAG Floragatan 10 B S-114 31 Stockholm Sweden	State of Nationality SE	State of Residence SE
Telephone No.		
Facsimile No.		
Teleprinter No.		

3. Further observations, if necessary:

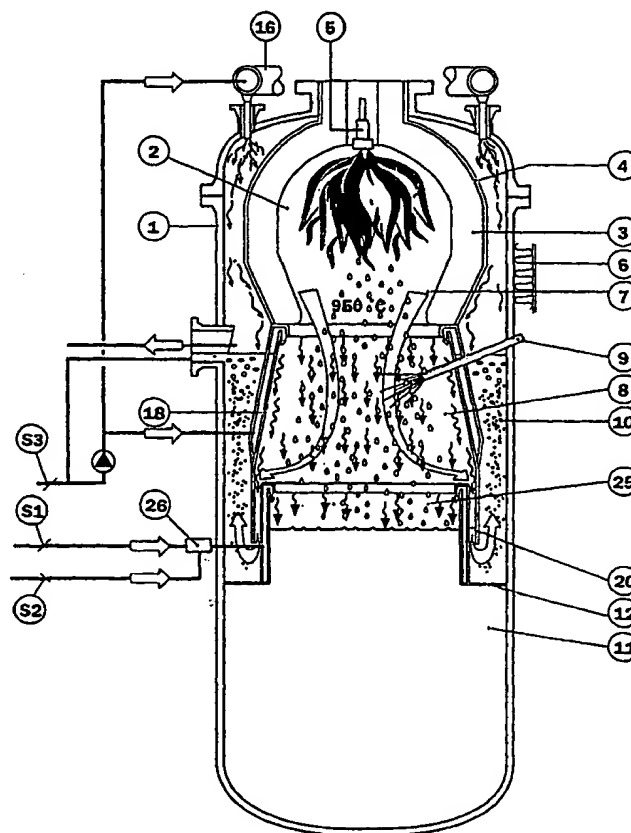
4. A copy of this notification has been sent to:

☒ the receiving Office
 ☐ the designated Offices concerned
☐ the International Searching Authority
 ☒ the elected Offices concerned
☐ the International Preliminary Examining Authority
 ☐ other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer François BAECHLER Telephone No.: (41-22) 338.83.38
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : D21C 11/12	A1	(11) International Publication Number: WO 00/60161 (43) International Publication Date: 12 October 2000 (12.10.00)
(21) International Application Number: PCT/SE00/00547 (22) International Filing Date: 22 March 2000 (22.03.00) (30) Priority Data: 9901185-0 1 April 1999 (01.04.99) SE (71) Applicant (for all designated States except US): KVAERNER CHEMREC AB [SE/SE]; P.O. Box 1033, S-651 15 Karlstad (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): NILSSON, Bengt [SE/SE]; Gränsvägen 21, S-663 00 Skoghall (SE). (74) Agent: KVAERNER CHEMREC AB; Furhem, Hans, P.O. Box 1033, S-651 15 Karlstad (SE).		(81) Designated States: CA, FI, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: PROCESS FOR COOLING SOLID AND GASEOUS MATERIAL DURING GASIFICATION OF SPENT LIQUOR		
(57) Abstract		
<p>Process for the recovery of chemicals and energy from spent liquor obtained in the chemical pulping process, in which the spent liquor is gasified under sub-stoichiometric conditions to produce partly one phase of solid and/or fused material, together with partly one phase of a flammable gaseous material, whereafter the said phases are cooled by direct contact with a cooling medium (9), is separated from the said phase of flammable gaseous material in order to be dissolved and collected up as a product liquid in a product liquid receiver (11). According to the invention, the said cooling medium (9) consists of an essentially water-free cooling medium, which after vaporizing/cracking increases the calorific value of the flammable gaseous material drawn off. At the same time, the process is improved in this way since the flammable gases can be used more effectively for the purpose of e.g. generating energy.</p>		



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PROCESS FOR COOLING SOLID AND GASEOUS MATERIAL DURING GASIFICATION OF SPENT LIQUOR

TECHNICAL FIELD

5 The present invention concerns a process for the recovery of chemicals and energy from the spent liquor obtained in the chemical pulping process, in which the spent liquor is gasified under sub-stoichiometric conditions to produce partly one phase of solid and/or
10 fused material and partly one phase of a flammable gaseous material, whereafter the said phases are cooled by direct contact with a cooling medium, and the solid and/or fused material is/are separated from the said flammable gaseous phase to be dissolved and collected
15 as a product liquid in a product liquid receiver.

STATE OF THE ART

For a very long time the commercially dominating process conventionally used for the recovery of energy
20 and chemicals from the so-called black liquor, which is obtained in the production of paper pulp according to the sulphate method, has been the so-called Tomlinson process which uses a so-called soda furnace.

A more modern process is described in Swedish
25 patent SE-C-448 173, which process is based on the sub-stoichiometric gasification/pyrolysis (i.e. a deficiency of oxygen) of the black liquor in a reactor. The resulting products are one phase consisting of solid and/or fused material, chiefly containing sodium
30 carbonate, sodium hydroxide and sodium sulphide plus a high calorific value flammable gaseous phase, chiefly containing carbon monoxide, carbon dioxide, methane, hydrogen gas and hydrogen sulphide. The mixture of the solid/fused phase and the gaseous phase is cooled and
35 separated by direct contact with green liquor in a separating unit connected to the reactor, the solid/fused phase being dissolved in the green liquor. The green liquor is then led to a conventional causticizing step for the production of white liquor.

- 2 -

The gaseous phase is used as fuel for the generation of steam and/or electrical power.

WO95/35410 and WO96/14468 disclose examples of further development of the process described in SE-C-448 173. In these two patent applications the problem, among others, concerning the ability to minimize the content of bicarbonate and carbonate in the liquor produced is dealt with, the resolutions include the minimization of contact between the gaseous phase and the liquor formed in the gasification, as well as the recycling of hydrogen sulphide back to the reactor thereby shifting the reaction equilibrium therein.

It is now evident that further measures can be needed in certain cases to avoid a bicarbonate content and to minimize the carbonate content of the green liquor produced as a consequence of the absorption of carbon dioxide from the flue gas into the liquor produced. In WO95/35410 it is disclosed for example that a small part of the green liquor is used to wet the inside of the separating section between the reactor and the product liquid receiver. This small quantity of green liquor has been shown to lead to undesirable absorption of carbon dioxide in the green liquor, with resulting production of bicarbonate and increased carbonate content.

It is also evident that the water which is sprayed in dissolves the condensed drops of fused material to form a water-fused material solution, in which the hot solution is soon carbonated by carbon dioxide contained in the flue gas. This suggests that water ought to be avoided in the hot transfer zones where the carbon dioxide content of the flue gas can lead to carbonate formation.

DESCRIPTION OF THE INVENTION

The present invention has the objective of minimizing or eliminating the problems mentioned above, in which a process for the sub-stoichiometric gasification of spent liquor, which leads to reduced

- 3 -

carbonate formation and eliminates the bicarbonate content of the produced liquor and simultaneously increases the calorific value of the flue gas, is disclosed.

5 The process according to the invention is defined in Patent Claim 1.

 Thus, according to the invention, a cooling medium is provided, which is used in the reactor's outflow of product gases and product fused or solid material,
10 which is an essentially water-free cooling medium, which cooling medium is at least partly vaporized or cracked.

 The vaporized/cracked cooling medium is thereafter drawn off together with the phase of flammable gaseous
15 material, and which cooling medium is chosen so that preferably after vaporization/cracking it increases the calorific value of the flammable gaseous material.

 According to one aspect of the invention, the cooling medium provided is a liquified gas, which
20 preferably is chosen from the group which consists of nitrogen, methane, propane or other hydrocarbons which are in the gaseous state at NTP. NTP is defined as 0°C and 1.013 bar. In order for the gas to be liquified for use in connection with the process according to the
25 invention, it has been cooled and/or compressed.

 According to another aspect of the invention, the cooling medium consists of at least one essentially organic liquid, which is chosen preferably from the group which consists of turpentine, tall oil, methanol
30 and other alcohols which are in the liquid state at NTP.

 According to a further aspect of the invention, the cooling medium is recovered in association with the process for the said chemical pulping process or with
35 the process for the recovery of chemicals and energy from the spent liquor. Thus, the cooling medium is preferably produced internally in the factory starting with the traditional raw materials and products in a

pulp factory. Turpentine, tall oil and methanol are all by-products of pulping process.

When using the process according to the invention, getting fused material drops going into solution is avoided. Thus, carbon dioxide absorption is prevented/minimized and at the same time the vaporized/cracked cooling medium increases the calorific value of the flue gas.

The cooling media should be chosen according to their capacity to reduce the temperature in the separating section, preferably down to a level where some overheating remains. The remaining cooling down to saturation temperature for the flue gases takes place in the condensate bath and for the fused material fraction in the product liquid receiver.

The ceramic lined upper part of the reactor is connected to a liquid film cooled separating section for fused material/flue gas. Also in this separating section, a large proportion of the reactions takes place, so that the reaction space consists partly of the upper part of the reactor plus the subsequent separating section.

DESCRIPTION OF THE FIGURE

The invention is described by means of an embodiment in the following and by reference to Figure 1.

A pressure vessel 1 is shown in Figure 1. On the exterior of the pressure vessel 1 there is an insulation 6 and within the pressure vessel 1 an upper reactor section 2 is arranged which is made of a shell 4 of sheet metal fitted with a ceramic lining 3.

A burner 5 for black liquor is arranged at the top of the reactor part 2 in association with inlets, not shown, for black liquor and oxygen and/or other oxygen containing gas such as air. At the bottom of the reactor section there is an opening 7 by which opening a separating section 8 is connected to the reactor section. Arranged around the separating section 8 there

is a cooling liquid bath 10, henceforth called the condensate bath. In the embodiment shown the condensate bath 10 is located in the same vessel 1 as is the reactor section 2, the separating section 8 and a product liquid receiver 11, henceforth called the green liquor receiver. The green liquor receiver 11 is here located beneath the condensate bath 10, from which it is separated by a horizontal divider 12.

In the embodiment, the essentially water-free cooling medium is sprayed 9, via spray lances or spray nozzles, into a separating section 8 in order to cool the stream of solid and/or fused phase and flue gases flowing out of the reactor. Only one spray lance 9 is shown in Figure 1 but it should be understood that a number of such lances can be arranged round the circumference of the separating section 8. Vaporized/cracked cooling medium leaves the separating section with the flue gas through an exit 20 to be led thereafter to burners and/or gas-driven turbines for electricity generation in the so-called combined heat and power concept.

In the embodiment, the upper part of the separating section 8 is cooled/wetted with condensate from the condensate bath 10, which is used to form a liquid film on the inside of a wall 18 of the separating section 8. The inside of the lower part 25 is cooled/wetted in a corresponding way with a film of green liquor from the green liquor receiver 11.

Other embodiments can be envisaged without the spray lances or nozzles, but with a supply of the essentially water-free cooling medium as a cooling/wetting liquid film in the upper and/or lower parts of the separating section. Yet another variant is, with or without supplementary spray lances or nozzles with essentially water-free cooling medium, to have essentially the water-free cooling medium as cooling/wetting liquid in the upper part of the separating section, while the cooling/wetting liquid in the lower part of the separation section consists of

- 6 -

the green liquor. Naturally, the essentially water-free cooling medium can be used as the cooling/wetting liquid in both the upper part of the separating section and in the lower part as well as in the spray lances.

5 In the case of embodiments with the separation section in only one part, it is possible to envisage, in a corresponding way, introducing the essentially water free liquid via spray lances/nozzles and/or as cooling/wetting liquid on the inside of the separation

10 section, or that the inside of the separation section is cooled/wetted with a water-containing liquid, e.g. condensate. Those skilled in the art can easily see how the various liquids can be distributed and used according to the various permutations of the apparatus.

15 The invention is not limited to the embodiments presented above, but includes variations within the scope of the following patent claims. The arrangement can e.g. also be used in connection with the sub-stoichiometric gasification of spent liquors other than

20 conventional black liquor e.g. sulphite liquor, bleaching liquor or black liquor from a potassium-based process. Furthermore, the green liquor receiver can be replaced with a white liquor receiver, when the process is arranged to avoid causticizing and instead produces

25 directly a white liquor with high sulphide, e.g. according to WO91/08337 or EP617 747.

PATENT CLAIMS

1. Process for the recovery of chemicals and energy from the spent liquor obtained in the chemical pulping process, in which the spent liquor is gasified under sub-stoichiometric conditions to produce partly at least one phase of solid and/or fused material and partly at least one phase of a flammable gaseous material, whereafter the said phases are cooled by direct contact with a cooling medium (9), whereafter the phase of solid and/or fused material is/are separated from the said phases of flammable gaseous material in order to be dissolved and collected as a product liquid in a product liquid receiver (11),
c h a r a c t e r i z e d i n that the said cooling medium (9) consists of an essentially water-free cooling medium, which cooling medium is at least partly vaporized or cracked, whereby the vaporized/cracked cooling medium is drawn off (20) together with the said phase of flammable gaseous material, plus that the cooling medium (9) after vaporizing/cracking increases the calorific value of the flammable gaseous material relative to the calorific value of the flammable gaseous material without addition of the essentially water-free cooling medium.

2. Process according to Claim 1,
c h a r a c t e r i z e d i n that the said cooling medium (9) consists of a liquified gas, which preferably is chosen from the group which consists of nitrogen, methane, propane and other hydrocarbons which are gaseous at NTP.

3. Process according to Claim 1,
c h a r a c t e r i z e d i n that the said cooling medium (9) consists of an organic liquid, which preferably is chosen from the group which consists of turpentine, tall oil, methanol and other alcohols which are liquids at NTP.

- 8 -

4. Process according to any of the above claims,
c h a r a c t e r i z e d i n that the said cooling
medium (9) is recovered in the said chemical pulping
process or in the process for recovery of chemicals and
5 energy from the spent liquor.

5. Process according to any of the above claims,
c h a r a c t e r i z e d i n that contact between the
said flammable gaseous material and the said product
10 liquid is avoided.

6. Process according to any of the above claims,
c h a r a c t e r i z e d i n that the said cooling
medium (9) is sprayed into the mixture of solid and/or
15 fused material and flammable gaseous material produced
by the gasification, preferably in connection with the
separation of these two phases (8,25) from each other.

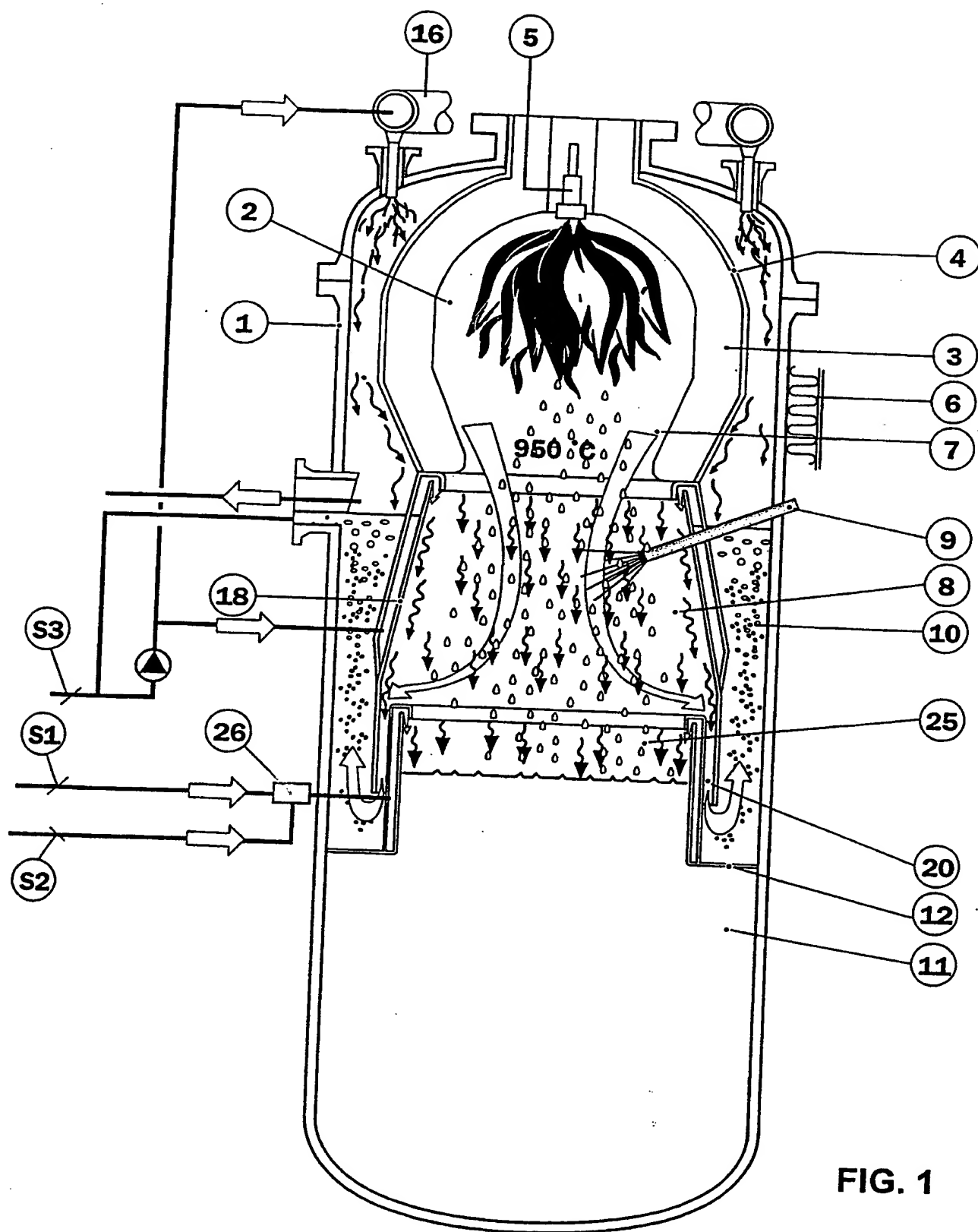
7. Process according to any of the above claims,
20 c h a r a c t e r i z e d i n that the cooling with
the said essentially water-free cooling medium (9) is
carried out as a first stage in connection with the
separation of the material phases produced by
gasification from each other, whereafter further
25 cooling is carried out in a second stage with a second
cooling medium (10), which second cooling medium
consists essentially of water.

8. Process according to any of the above claims,
30 c h a r a c t e r i z e d i n that the separation in
the separation section forms a part of the total
reaction vessel, in which reaction vessel an
essentially even temperature is maintained, which
temperature corresponds to the gasification
35 temperature.

- 9 -

9. Process according to Claim 8,
c h a r a c t e r i z e d i n that an inert gas is
added immediately above the product liquid receiver
surface, to form a protecting blanket over the product
5 liquid receiver by which means carbonation of boiling
and splashing green liquor from the product liquid
receiver is prevented.

10. Process according to Claim 9,
10 c h a r a c t e r i z e d i n that a further cooling
is carried out by means of the said product liquid
(11), preferably in the form of a liquid film on a wall
arranged directly before the solid/fused material
reaches the product liquid receiver.



A. CLASSIFICATION OF SUBJECT MATTER

IPC7: D21C 11/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: D21C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SE 448173 B (CROON INVENTOR AB), 26 January 1987 (26.01.87) --	1-10
A	WO 9535410 A1 (KVAERNER PULPING TECHNOLOGIES AB), 28 December 1995 (28.12.95) --	1-10
A	WO 9614468 A1 (KVAERNER PULPING TECHNOLOGIES AB), 17 May 1996 (17.05.96) -- -----	1-10

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

4 August 2000

Date of mailing of the international search report

11-08-2000

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT
Information on patent family members

02/12/99

International application No.
PCT/SE 00/00547

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
SE 448173 B	26/01/87	AT 45403 T	15/08/89
		BR 8606701 A	11/08/87
		CA 1272005 A	31/07/90
		EP 0223821 A,B	03/06/87
		SE 0223821 T3	
		ES 555387 A	16/04/87
		FI 82494 B	30/11/90
		FI 870449 A	02/02/87
		JP 3043393 B	02/07/91
		JP 62503110 T	10/12/87
		PT 82677 B	03/03/88
		SE 8502731 A	04/12/86
		US 4808264 A	28/02/89
		WO 8607396 A	18/12/86
WO 9535410 A1	28/12/95	AU 2811295 A	15/01/96
		BR 9508080 A	02/09/97
		FI 965088 A	18/12/96
		JP 10504607 T	06/05/98
		SE 502038 C	24/07/95
		SE 9402197 A	24/07/95
WO 9614468 A1	17/05/96	AU 3884595 A	31/05/96
		CA 2202753 A	17/05/96
		FI 971867 A	30/04/97
		JP 10509481 T	14/09/98
		SE 9403786 A	05/05/96

TENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 9937 PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/SE00/00547	International filing date (<i>day/month/year</i>) 22.03.2000	Priority date (<i>day/month/year</i>) 01.04.1999
International Patent Classification (IPC) or national classification and IPC ₇ D 21 C 11/12		
Applicant Kvaerner Chemrec AB et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
- ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 06.10.2000	Date of completion of this report 11.12.2000
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer Helena Hemphälä/ELY Telephone No. 08-782 25 00

Form PCT/IPEA/409 (cover sheet) (January 1998)

I. Basis of the report**1. With regard to the elements of the international application:***

- ☒ the international application as originally filed
- ☐ the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement) under article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the drawings:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language english which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims	<u>1-10</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-10</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-10</u>	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

This report is based on the claims as originally filed.

The invention relates to a process for recovering chemicals and energy from spent liquor gasified under sub-stoichiometric conditions. A solid/fused phase and a flammable gaseous phase are produced and further cooled by direct contact with an essentially water-free medium.

The following documents are cited in the International Search Report:

D1: SE 448173

D2: WO 9535410

D3: WO 9614468

Documents D1, D2 and D3 all disclose methods with water or water-containing cooling medium.

D1-D3 are considered to be state of the art documents.

The invention according to the stated claims 1-10 is novel and involve an inventive step. The claims fulfill the criterion of industrial applicability.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

3

Applicant's or agent's file reference 9937 PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/SE00/00547	International filing date (<i>day/month/year</i>) 22.03.2000	Priority date (<i>day/month/year</i>) 01.04.1999
International Patent Classification (IPC) or national classification and IPC ₇ D 21 C 11/12		
Applicant Kvaerner Chemrec AB et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
- ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 06.10.2000	Date of completion of this report 11.12.2000
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer Helena Hemphälä/ELY Telephone No. 08-782 25 00

I. Basis of the report**1. With regard to the elements of the international application:***

- ☒ the international application as originally filed
- ☐ the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement) under article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the drawings:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE00/00547

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)

Claims 1-10

YES

Claims

NO

Inventive step (IS)

Claims 1-10

YES

Claims

NO

Industrial applicability (IA)

Claims 1-10

YES

Claims

NO

2. Citations and explanations (Rule 70.7)

This report is based on the claims as originally filed.

The invention relates to a process for recovering chemicals and energy from spent liquor gasified under sub-stoichiometric conditions. A solid/fused phase and a flammable gaseous phase are produced and further cooled by direct contact with an essentially water-free medium.

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D1-D3 are considered to be state of the art documents.

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